HIGH EFFICIENCY CENTRIFUGAL COMPRESSOR ENCOURAGES ENVIRONMENTAL COMPLIANCE THROUGH REDUCED ENERGY COSTS

Payoff

Increasing the efficiency of lubrication free centrifugal compressors will significantly decrease energy costs and increase military and commercial applications for centrifugal compressor heat pumps. Utilization of environmentally friendly refrigerants will increase compliance to environmental regulations.

Accomplishment

Under the Lubrication Free, Magnetic Bearing, High-Efficiency Centrifugal Compressor program sponsored by the Propulsion Directorate, an innovative, lightweight, lubrication free refrigeration compressor that can be used with new non-ozone-depleting refrigerants was developed. The efficiency for this low flow rate centrifugal compressor was increased from 60% to 80%. Compressor efficiencies approaching 90% are achievable.

Background

The Lubrication Free, Magnetic Bearing, High-Efficiency Centrifugal Compressor program's

technological heritage is in the Directorate's previous spacecraft heat pump efforts. These previous efforts, funded through the Small Business Innovation Research Program, included the demonstration of magnetic bearing technology. Mainstream Engineering Corporation of Rockledge FL coupled this technology with their computer-aided design/manufacturing (CAD/CAM) design of a new compressor wheel to develop the lubrication free refrigeration compressor. Their CAD/CAM approach resulted in the fabrication and test of the compressor wheel design in days instead of the previously required months. Removal of the oil from the refrigeration system increases refrigerant stability. In the pure state, proposed environmentally safe alternative refrigerants remain relatively stable to temperatures up to 370°C. The presence of oil lowers the stability limits to below 100°C. Eliminating oil from the compressor allows for the well known vapor compression heat pump to be used. The vapor compression heat pump remains the most efficient refrigeration and air conditioning cycle available.